

Map Unit Properties Table

Age	Unit Name (Symbol)	Features and Description	Erosion Resistance	Suitability for Development	Hazards	Potential Paleontologic Resources	Potential Cultural Resources	Mineral Specimens	Potential for Karst Issues	Mineral Resources	Habitat	Recreation Potential	Global Significance
QUATERNARY-TERTIARY	Alluvium (Qa), Colluvium (Qc), Terraces (QTt)	Unconsolidated clay, silt, sand, and gravel underlying flood plains; cobbles and boulders on mountain slopes; sand, gravel, and boulders underlying flat benches and isolated hills; includes some strath terraces with no deposits	Low	No restrictions unless undercut on saturated slope; may be too permeable for waste facilities.	Slope processes such as slumping, sliding, creep	Pollen horizons	Artifacts, battle relics, (e.g., bullets) common locally	Cobbles from metamorphic crystalline basement rocks	None	Sand, gravel, pebbles, clay, river cobbles for building material	Riparian habitats along rivers; loose substrate for burrows	Trails, picnic and camping areas	Terrace deposits record downcutting of major rivers
CRETACEOUS	Potomac Formation (Kps)	Sand and clay with plant leaves; stems and trunks in the Coastal Plain Province	Low	High permeability may compromise waste facilities; otherwise, no restrictions to development	Slope processes such as slumping, sliding, creep	Plant leaves & stems; tree trunks	Charcoal, tools, implements from Native Americans	None	None	Sand, clay, pebbles	Riparian habitats along rivers; loose substrate for burrows	Trails, picnic and camping areas	Represents Cretaceous deposition in the region
JURASSIC	Diabase dikes and sills (Jd)	Black fine- to coarse- grained crystalline diabase in the Culpeper Basin of the Piedmont Province	High	No restrictions	Rockfalls possible on high angle slopes	None	None	Coarse grained crystalline diabase	None	None	None	None	Represents regional Jurassic time
TRIASSIC	Balls Bluff Siltstone- Lacustrine Member (TRbl); Balls Bluff Siltstone- Leesburg Member (TRbs); Manassas Sandstone- Poolsville Member (TRmp), Manassas Sandstone- Tuscarora Creek Member (TRmt), Manassas Sandstone- Reston Member (TRmr)	Red arkosic sandstone, pink variegated carbonate conglomerate, red arkosic sandstone, pink variegated carbonate conglomerate, tan quartz- pebble conglomerate	Moderate to high	Rich in carbonate; may be compromised by dissolution and friability, hummocky topography locally suggests sinkholes and caves	Sinkholes, caves, rockfalls where exposed on high angle slope	Crocodile footprints, small bird- like fossils; bones & teeth of phytosaur, coelacanth fossils; arthropods; lizard footprints, carnivorous dinosaur footprints, fossil sauropods, ornithischians prosauropods, & aetosaur	Chert pebbles may have supplied tool material	None	High; hummocky topography locally in carbonate units such as Leesburg Member of Balls Bluff Siltstone	Attractive building stones	Vugs, caves, sinkholes, etc. provide habitat for nesting birds, bats, and other burrowing animals	Climbing on sandstone units	
MISSISSIPPIAN	Purslane Formation(Mp) Rockwell Formation (MDr)	Red and brown sandstone and pebble conglomerate, Green to gray sandstone, siltstone, and shale	Moderate to high (sandstone); Moderate (siltstone)	Unless highly fractured, no restrictions	Rockfall possible where units are exposed on high angle slope; mud- rich units may prove unstable on slopes	Brachiopods; rare conodonts	None	None	Low	None	None	Climbing on sandstone units	Contains Mississippian fossils and represents that time for the region
DEVONIAN	Lamprophyre dike (Dl), Hampshire Formation (Dh), Foreknobs Formation (Df), Brallier Formation (Db), Mahantango Formation (Dm), Marcellus Shale and Needmore Formations (Dmn), Oriskany Formation (Do), Helderberg Formation and Keyser Limestone (DShk)	Gray fine- grained quartz- plagioclase rock with biotite crystals; gray, green, and red sandstones; siltstones and shales; conglomeratic sandstones; medium- and coarse- grained sandstones; dark gray, fine- grained sandstones; light gray siltstones; calcite- rich shales and limestones; pebble conglomerates and cherty limestones	High (igneous rocks), Moderate	Units rich in carbonates may be compromised by dissolution and friability; unless highly fractured no restrictions documented	Karst features probable in carbonate units; rockfalls possible on high angle slopes; mud- rich units may be unstable on slopes	Brachiopods, clams, snails, cephalopods, trilobites (rare), conodonts	Chert nodules may have supplied tool material	Biotite crystals in lamprophyre dike	Moderate, in limestone rich units such as Keyser Limestone	None	Vugs in Keyser Limestone may provide nesting/bat habitat	None	Lamprophyre dike documents Devonian igneous intrusion
SILURIAN	Tonoloway Limestone (Stl), Willis Creek Formation (Sw), Bloomsburg Formation (Sb), McKenzie Formation (Sm), Keefer Sandstone (Sk), Rosehill Formation and Keefer Sandstone (Srk), Rosehill Formation (Sr), Tuscarora Quartzite (St)	Gray limestones, dolomites, calcareous shales, and thin sandstones; gray shales; claystones; red sandstones; siltstones; gray sandstones with <i>Skolithus linearis</i> ; tan and red siltstones; red hematite sandstones and tan sandstones; white and gray quartzites; quartz pebble conglomerates	Moderate	Unless highly fractured, or rich in carbonates should be suitable for most development, no restrictions documented	Sinkholes, caves, rockfall where units are exposed on high angle slope	<i>Skolithus linearis</i> , brachiopods, snails, ostracodes, <i>Lepidostria</i> , eurytids (sea scorpions), bryozoans, corals, trilobites, stromatoporoids	Chert pebbles may have supplied tool material	Red hematite	High in Tonoloway Limestone	Attractive quartzite for building	Vugs, caves, sinkholes, etc. provide habitat for nesting birds, bats, and other burrowing animals	None	Units useful for correlation, esp. if rich in fossils

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ORDOVICIAN	Juniata Formation (Oj), Upper Member of Martinsburg Formation (Omu), Stickley Run Member of Martinsburg Formation (Oms), Chambersburg Limestone (Oc), New Market Limestone (On), Pinesburg Station Dolomite (Op), Kensington Tonalite (Ok)	Maroon sandstone and siltstone; brown and green shale, siltstone, and sandstone; gray shale and limestone; gray argillaceous, nodular limestone; gray thick-bedded limestone; gray, cherty, fractured dolomite; gray garnet-rich, muscovite-biotite tonalite	Moderate	Carbonate dissolution may render them too permeable for waste facility development; sinkholes and karst pose potential problems in carbonate rich units	Karst features probable in carbonate units, rockfall possible on high angle slopes, mud rich units may prove unstable on slopes	Snails, clams	Chert nodules may have supplied tool material	Garnets, muscovite (mica)	High in carbonate-limestone rich units	None	Vugs, caves, sinkholes, etc. provide habitat for nesting birds, bats, and other burrowing animals	None	Type locality for New Market Ls. and Martinsburg Fm.
	Georgetown Intrusive Suite- Biotite/hornblende (Ogh), Georgetown Intrusive Suite- Biotite tonalite (Ogb), Georgetown Intrusive Suite- Quartz gabbro and quartz diorite (Ogg), Georgetown Intrusive Suite-Serpentine, soapstone, and talc schist (Ogv)	Gray foliated biotite-hornblende tonalite containing inclusions of mafic and metasedimentary rock; dark gray foliated quartz gabbro and quartz diorite; green foliated serpentinite, soapstone, and talc schist	High; Low (serpentinite, soapstone, talc schist)	High mica content may be unstable for foundations; otherwise, no restrictions	Rockfall possible where units are exposed on high angle slope	None	Soapstone and talc may have been used for sculpting	Soapstone	None	Soapstone and talc	None	None	Ordovician igneous activity
	Dalecarlia Intrusive Suite- Biotite monzogranite and granodiorite (Odm), Dalecarlia Intrusive Suite- Muscovite trondjemite (Odt), Rockdale Run Formation (Orr), Bear Island Granodiorite (Ob), Stonehenge Limestone (Os), Stoufferstown Member of Stonehenge Limestone (Oss), Quartz (Oq), Conococheague Limestone (OCC)	Gray foliated biotite monzogranite and granodiorite; light gray muscovite trondjemite, occurring as dikes, sheets and bodies; gray limestone interbedded with dolomite; light gray and white muscovite-biotite granodiorite and pegmatite; gray limestone; gray silty, laminated limestone with shale partings; massive bodies of white vein quartz; gray limestone interbedded with gray dolomite and sandstone	Moderate to high	Possible carbonate dissolution in Conococheague Limestone; high mica contents may be unstable for foundations, otherwise, no restrictions	Rockfall possible where units are exposed on high angle slope, karst features probable in carbonate rich units	Trilobites, conodonts, snails, brachiopods, cephalopods, echinospaerites, bryozoans	None	Pegmatite minerals	High in Stonehenge and Conococheague Limestones	Gold and other rare minerals associated with vein quartz and pegmatites	Vugs, caves, sinkholes, etc. provide habitat for nesting birds, bats, and other burrowing animals	Caving?	Ordovician igneous activity
CAMBRIAN	Conococheague Limestone- Big Spring Member (Ccb), Frederick Formation- Adamstown Member (Cfa), Frederick Formation- Rocky Springs Station Member (Cfr), Elbrook Limestone (Ce), Araby Formation (Car)	Dolomite and dolomitic sandstone; silty limestone and silty dolomite; dolomitic limestone; breccia of limestone clasts and sandstone; interbedded limestone and dolomite; gray and brown mottled sandy metasiltstone	Moderate	Sinkholes and karst pose potential problems in carbonate-rich units	Sinkholes, caves, rockfall where units are exposed on high angle slope	Trilobites, conodonts, stromatolites	Chert pebbles may have supplied tool material	None	High in carbonate-rich units	Attractive building stones, many used in Washington D.C. buildings and monuments	Vugs, caves, sinkholes, etc. provide habitat for nesting birds, bats, and other burrowing animals	Caving?	Famous marbles for monuments; Frederick Fm. type locality is nearby
	Waynesboro Formation- Chewsville Member (Cwac), Waynesboro Formation- Cavetown Member (Cwak), Waynesboro Formation- Red Run Member (Cwar)	Red siltstone and shale; gray limestone interbedded with dolomite; tan sandstone and green shale	Moderate	Mudstone-rich slopes may be unstable; possible limestone dissolution; otherwise, no restrictions	Shale units can be unstable on slopes; karst features, rockfall on high angle slopes	Lower Cambrian fossils rare	None	None	High in Cavetown Member of Waynesboro Fm.	None	Vugs in Cavetown Member may provide nesting/bat habitat	Caving?	
	Tomstown Formation (Ct), Tomstown Formation- Dargan Member (Ctd), Tomstown Formation- Benevola Member (Ctb), Tomstown Formation- Fort Duncan Member (Ctf), Tomstown Formation- Bolivar Heights Member (Ctbh)	Grey dolomite; gray limestone interbedded with dolomite; light gray dolomite; dark gray dolomite with bioturbation structures; dark gray limestone	Moderate	Cleavage along bedding planes in Tomstown Formation may be surfaces of weakness	Sinkholes, caves, rockfall where units are exposed on high angle slope	Lower Cambrian fossils rare	None	Sphalerite, calcite locally in vugs of Tomstown Formation	High	None	Vugs in Tomstown Fm. may provide nesting/bat habitat	None documented	Type locality for Tomstown Fm.

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CAMBRIAN	Carbonaceous phyllite (Ccp) , Antietam Formation (Ca), Harpers Formation (Ch), Weverton Formation (Cw), Sykesville Formation (Cs), Laurel Formation (Cl), Loudoun Formation- Conglomerate (Chilhowee Group Units) (Clc)	Dark gray lustrous graphitic phyllite; brown iron- rich sandstone; gray and green phyllitic metasiltstone; gray quartzite and dark metasiltstone and metagraywacke and pebble conglomerate; gray quartzofeldspathic matrix with fragments and bodies of metamorphosed sedimentary, volcanic, and igneous rocks; gray quartzofeldspathic matrix with fragments of meta-arenite and muscovite biotite schist; dark gray and blue variegated cobble and pebble conglomerate; clasts composed of vein quartz, quartzite, red jasper, greenstone, and gneiss	Moderate (sandstone), High (igneous rocks)	Bedding plane cleavages may be surfaces of weakness; intersecting joints in Weverton Fm. may compromise rock strength; large scale folds (Blue Ridge Anticlinorium) create steep dip which be unstable if undercut; faults in Weverton and Loudoun Fms. are weak points; karst processes likely	Karst features probable in carbonate units; rockfall possible where unit is exposed on high angle slope, mud rich units may prove unstable on slopes	Harpers and Weverton Fms. make up several buildings in Harpers Ferry and have hand-carved steps leading up slope	Zircon, magnetite, ilmenite, and tourmaline in sedimentary rocks locally; red jasper in Loudoun Fm.; large quartz grains and magnetite in Weverton Fm.; large quartz pebbles in Antietam Fm.	Very high, responsible for sinkholes, caves, etc.	Vugs, caves, sinkholes, etc. provide habitat for nesting birds, bats, and other burrowing animals	Climbing on sandstone units, caving	Type localities for Harpers, Antietam, Loudoun, Weverton Fms.		
PRECAMBRIAN	Loudon Formation- Phyllite (CZlp), Ijamsville Phyllite- Phyllite (CZi), Ijamsville Phyllite- Greenstone (CZig), Ijamsville Phyllite- Metalimestone (CZil), Mather Gorge Formation- Metagraywacke (CZmg), Mather Gorge Formation- Migmatite (CZmm), Mather Gorge Formation- Phyllonite (CZmp), Mather Gorge Formation- Schist (CZms), Ultramafic rock (CZu), Amphibolite and ultramafic rock (CZa), Metagabbro and metapyroxenite CZg), Tuffaceous schist (CZt)	Gray, black, cream, and pink variegated phyllites, slates, and phyllonites with vein quartz; green schistose basaltic volcanic rock; gray metagraywackes interbedded with schist; mixture of former partial melt of dark gray quartzose schist (older paleosome) and light gray and white quartz plagioclase granitoid (younger leucosome); gray and green lustrous chlorite-sericite phyllonite; gray, green, and brown quartz- rich schist and mica gneiss interbedded with metagraywacke and calc-silicate rock; dark and light green serpentinite, soapstone, and talc schist; dark green and black amphibolite and ultramafic rock; dark metagabbro and metapyroxenite; hornblende- plagioclase- quartz-muscovite felsic tuffaceous schist	Moderate	Intersections of bedding and flow cleavages in phyllites may be points of weakness in phyllitic units	Micaceous units may be unstable on steep slopes; rockfall possible where on steep slopes	None	None	Zircon and tourmaline in sedimentary rocks locally; sericite & magnetite present in Loudoun Fm.; ultramafic rocks	None	None	None	Climbing possible	
	Catoctin Formation- Greenstone (Zc), Catoctin Formation- Phyllite and Sandstone (Zcs), Metarhyolite dike (Zrd), Metadiabase dikes (Zmd), Swift Run Formation- Marble (Zsm), Swift Run Formation- Phyllite and Schist (Zsp), Swift Run Formation- Metasandstone (Zsq)	Green metamorphosed basaltic lava flows; gray variegated vesicular and blebby phyllite and tan medium- grained sandstone; tan fine- grained felsite with feldspar crystals; green schistose metadiabase; pink and tan massive to schistose marble; tan sandy sericitic phyllite; tan medium- grained metasandstone with cobbles and pebbles of vein quartz	Moderate to high	Intersections of bedding and flow cleavages in phyllites may be points of weakness in phyllitic units	Rockfall possible where units are exposed on high angle slope	None	None	Zircon and tourmaline in sedimentary rocks locally; sericite common; epidote and actinolite in Catoctin Fm.	None documented	Local marble lenses, and attractive quartzite beds in Swift Run Fm., greenstone in Catoctin Fm.	None	None	Provide insight to Precambrian tectonics
	Biotite granite gneiss (Ybg), Leucocratic metagranite (Yg), Garnetiferous leucogranite metagranite (Ygt), Quartz plagioclase gneiss (Ygp), Hornblende monzonite gneiss (Yth), Garnet graphite paragneiss (Yp)	Light gray foliated granite gneiss with black specks of biotite; light- gray foliated metagranite; light gray foliated metagranite with garnet; white massive gneiss; tan to dark foliated gneiss with greenish black hornblende crystals; rust- colored schist with garnet crystals and flakes of graphite	High	Gneissic foliation and associated joints, cleavage, and fractures may be planes of weakness	Rockfall possible where units are exposed on high angle slope	None	None	Potash feldspar augen, clear albite crystals, rare garnets, zoisites	None documented	Rare graphite	None	Climbing possible	Oldest rocks in region; Precambrian tectonics